
INTRODUCTION TO THE WORKBOOK

1. Getting Started

The gases covered in the *Guidelines* are the direct greenhouse gases, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), the indirect greenhouse gases carbon monoxide (CO), oxides of nitrogen (NO_x), non-methane volatile organic compounds (NMVOCs), halocarbons (HFCs, PFCs), sulphur hexafluoride (SF₆), and sulphur dioxide (SO₂). Halogenated species (i.e. chlorofluorocarbons (CFCs), hydro-chlorofluorocarbon 22 (HCFC-22), the halons, methyl chloroform and carbon tetrachloride) are not included because of parallel reporting requirements of countries in compliance with commitments under the Montreal Protocol.

Although estimation methods are not provided, countries are encouraged to report any emissions or removals for which they have data and which they consider significant to climate change. Procedures for reporting other gases are discussed in Volume 1 of the *Guidelines, Reporting Instructions*.

To estimate greenhouse gas emissions and removals you should begin by developing a plan or strategy. The first step is to identify the range of possible source and sink activities that exist in your country. Second, you will need to establish priorities for inventory work based on several considerations. One consideration is the priorities among various greenhouse gases. The IPCC has recommended the direct greenhouse gases CO₂, CH₄, and N₂O as having highest priority. A second consideration is the relative importance of source and sink activities within the country and the availability of relevant information. Finally, once initial priorities have been developed, the analyst must identify and allocate resources to develop the inventory.

A description of greenhouse gas source and sink activities is provided in Volume I. The IPCC Scientific Assessments of 1990, 1995 and the 1992 Supplement presents the current understanding of the contributions of various source and sink activities in the global atmospheric balances of CO₂, CH₄ and N₂O. This information may be used by national experts in prioritising national inventory efforts. However, the relative importance of source and sink categories for a specific country may be substantially different than at a global level.

The stages are:

STEP 1 PLANNING THE INVENTORY

1 Review *Reporting Instructions*

Review the *Reporting Instructions* (Volume 1 of *IPCC Guidelines*) so you know what data are required. Look in detail at Chapter 1: *Understanding the Common Reporting Framework*. This discusses standard definitions of pollutants, units, source/sink categories and time periods.

2 Identify priority sources/sinks and priority greenhouse gases. Ultimately, each country should report all important sources and sinks of all greenhouse gases. However, in practice, countries with little prior experience, which are getting started on national inventories, may wish to prioritise the possible gases and sources in terms of relative importance to global and national totals. Proceeding with highest priority sources first will reduce the initial burden on national experts and allow key results to be reported more quickly in international fora.

General priorities for countries preparing inventories are (listed in order of highest to lowest priority):

- CO₂ from Energy sources
- CO₂ from Land-Use Change
- CH₄ from major source categories: Rice Production; Coal Mining; Oil and Natural Gas; Enteric Fermentation and Animal Waste; Landfills and Other Waste, and Biomass Burning
- N₂O from Agriculture
- Other greenhouse gases

This *Workbook* provides simple methods for all of the CO₂, CH₄ and N₂O, categories listed above to help national experts in the high priority areas. Countries can modify the suggested priorities based on the importance of these source and sink activities in their own national context.

STEP 2 USING THE IPCC DEFAULT METHODS/DATA

The *Workbook* contains default methods for the estimation of each of the main source categories for CO₂, CH₄, N₂O, halocarbons (HFCs, PFCs) sulphur hexafluoride (SF₆), and ozone and aerosol precursors. The *Reference Manual* contains background information on these methods and more detailed options. These methods are in various stages of testing and therefore are associated with different levels of confidence or "quality." IPCC's default methodology aims to provide the simplest realistic procedures for countries to use when making greenhouse gas emissions inventories. Default values are provided for emission factors and (some) activity data. Because default information is frequently general, and applicable to all countries of the world, it may not capture the variations in activities at the regional and national level that may significantly influence

emission levels. The Workbook is nevertheless a starting point for many countries that are preparing GHG inventories for the first time.

Countries may use more detailed methodologies, emission factors or activity data where these are compatible with IPCC source categories, and can be shown to give consistent and accurate results. Default emission factors and activity data also provide useful points of comparison for national assumptions. If a country's data vary significantly from the default data, the IPCC asks that the difference be explained.

STEP 3 USING THE WORKBOOK

The Workbook

The *Workbook* is designed to be a working document. You use it as an integral part of making an inventory of your country's greenhouse gas emissions and removals. It is divided into six modules, each with its own icon:

- Energy
- Industrial Processes
- Solvent and Other Product Use

[Solvent and Other Product Use is included in this version of the *Workbook* as a placeholder only. No simple estimation methods are provided for this category.]

- Agriculture
- Land-Use Change and Forestry
- Waste

Within each module a series of emission sources are identified. Each emission source contains one (or more) Worksheets. These are blank forms for making the inventory which you fill in and return to IPCC.

To help you to use the Worksheets, each emission source section also contains:

- a brief introduction
- a survey of data sources
- an overview of the methodology recommended for the source
- instructions for completing the Worksheet

If you want to know more about a particular emission source, refer to the *IPCC Greenhouse Gas Inventory Reference Manual*.

STEP 4 PROVIDING DOCUMENTATION

In every case written documentation should be provided along with inventory results explaining the sources of any input data which were not taken from the default data included in the *Workbook*. For example, energy related GHG input data includes energy data, conversion factors, emission factors, production data for products which store carbon and any other information which might affect the results in the inventory.

Preferably your documentation should cite published reports as the source of data. Government ministries, institutes or private firms that have provided data should be identified by a mailing address and a contact person. See Volume 1: *Reporting Instructions* for details of documentation requirements.

STEP 5 REPORTING FINER LEVELS OF DETAIL IN THE WORKSHEETS

For simplicity and clarity, the *Workbook* deals with calculation of emissions at a national level, with source categories broken down into relatively few subcategories. The level of detail in the subcategories is designed to match the available sources of default input data, carbon contents and other assumptions. However, as a user of the emissions methodology *Guidelines*, you are encouraged to carry out your national inventory at as fine a level of detail as possible. If your country has more detailed information on any of the source categories than that used in constructing the default values in this *Workbook*, you are encouraged to use it.

There are two ways in which this is possible:

- **Finer geographic detail**
Experts may find that it is necessary to divide a country into different regions to capture differences between ecosystems and biomass densities, agricultural practices, rates of burning etc.
- **Finer detail by subcategory**
Where data are available, experts may subdivide the categories of activity to reflect important differences in economic activity, ecology or species, land use or agricultural practices, rate of burning, etc.

Working at a finer level of disaggregation does not change the nature of the calculations although more locally developed data and assumptions will generally be required. Use multiple copies of the Worksheets for these calculations.

If you have calculated greenhouse gas emissions at a finer level of detail, you should also aggregate results up to the most detailed level of information requested by the IPCC Methodology in order to report them. This allows comparisons to be made among the results from countries participating in the inventory. You are also encouraged to report at the underlying level of detail if it is manageable.

Make sure that you report data and assumptions to the IPCC in order to ensure transparency and replicability of methods. *Reporting Instructions* (Volume 1 of the *Guidelines*) discusses these issues in more detail.

2 Basic Information to Help Work with the IPCC Guidelines

Prefixes and multiplication factors

The following multiplication factors are used throughout the *Guidelines*:

Multiplication Factor	Abbreviation	Prefix	Symbol
1 000 000 000 000 000	10 ¹⁵	peta	P
1 000 000 000 000	10 ¹²	tera	T
1 000 000 000	10 ⁹	giga	G
1 000 000	10 ⁶	mega	M
1 000	10 ³	kilo	k
100	10 ²	hecto	h
10	10 ¹	deca	da
0.1	10 ⁻¹	deci	d
0.01	10 ⁻²	centi	c
0.001	10 ⁻³	milli	m
0.000 001	10 ⁻⁶	micro	μ

Abbreviations for chemical compounds

The following abbreviations are used in the *Guidelines*:

CH ₄	Methane
N ₂ O	Nitrous Oxide
CO ₂	Carbon Dioxide
CO	Carbon Monoxide
NO _x	Nitrogen Oxides
NM VOC	Non-Methane Volatile Organic Compound
NH ₃	Ammonia
CFCs	Chlorofluorocarbons
HFCs	Hydrofluorocarbons
PFCs	Perfluorocarbons
SF ₆	Sulphur hexafluoride
CCL ₄	Carbon tetrachloride
C ₂ F ₆	Hexafluoroethane
SO ₂	Sulphur Dioxide

Standard equivalents

1 tonne of oil equivalent (toe)	1 x 10 ¹⁰ calories
10 ³ toe	41.868 TJ
1 short ton	0.9072 tonne
1 tonne	1.1023 short tons
1 tonne	1 megagram
1 kilotonne	1 gigagram
1 megatonne	1 teragram
1 kilogram	2.2046 lbs
1 hectare	10 ⁴ m ²
1 calorie _{IT}	4.1868 Joules
1 atmosphere	101.325 kPa

Units¹ and abbreviations

The following abbreviations are used in the *Guidelines*:

cubic metre	m ³
hectare	ha
gram	g
tonne	t
joule	J
degree Celsius	°C
calorie	cal
year	yr
capita	cap
gallon	gal
dry matter	dm

¹ For decimal prefixes see previous page.

